

- I. Project Title: Colorado River Embeddedness Monitoring Study
- II. Principal Investigator(s):
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III. Project Summary:

A program designed to monitor embeddedness of gravel and cobble substrates in the upper Colorado River was initiated. Baseline embeddedness data was previously collected during 1996-1998 as part of another study. This monitoring program will be used to determine effects of various flow regimes on substrate condition. Substrate composition affects primary and secondary production in riverine ecosystems. Periphyton and invertebrates, the food base of the fish community, depend on rock surfaces for attachment sites; in addition, invertebrates depend on the interstitial voids among rocks for shelter and feeding sites. Because the transport, sorting and deposition of coarse and fine-grained sediments is largely determined by the flow regime, gaining a better understanding of the link between streamflow, substrate characteristics, and food availability will allow managers to more effectively manipulate flows to maintain and enhance native fish habitat.

Monitoring was conducted in two reaches of the Colorado River in the Grand Valley, near Grand Junction; this area includes the highest concentrations of Colorado pikeminnow in the Colorado River. Monitoring sites in four riffles and four runs were sampled in the 15-mile reach, upstream of the Gunnison River confluence, and in four riffles and four runs in the 18-mile reach, immediately downstream of the Gunnison River confluence. At each site, 20 embeddedness measurements are made on each sampling date. Sampling was conducted once prior to runoff in early spring, twice during the descending limb of the hydrograph during late spring, and twice during base flow in late summer and fall.

- IV. Study Schedule: 1999-2009
- V. Relationship to RIPRAP: Coordinated Reservoirs I.A.4.c(3)(c)
- VI. Accomplishment of FY 99 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Tasks

1) Sample 16 embeddedness monitoring sites in the Grand Valley on five dates. This task was accomplished on schedule.

Initial findings indicate that total depth-to-embeddedness (DTE) in riffles during base flow declined significantly from 1996 to 1997 and again from 1997 to 1998. However, DTE in riffles did not change between 1998 and 1999. This was true in both the 15- and 18-mile reaches. For runs, total DTE steadily declined from 1997 to 1998 and 1998 to 1999 in both the 15- and 18-mile reaches. Peak flows during this period also declined. In the 15-mile reach, peak flows were: 1997, 26,500 cfs; in 1998, 14,400 cfs; in 1999, 12,700 cfs. In the 18-mile reach peak flows were: 1997, 36,800 cfs; in 1998, 24,700 cfs; in 1999, 17,200 cfs. Only in 1997 did the peak discharge exceed the threshold necessary for full mobilization of the bed. In the other years, thresholds were met that were necessary to initiate limited bed movement. This may be what kept riffle DTE levels in 1999 from falling below 1998 values. Alternatively, it may have been the elevated base flow levels that occurred during 1999 that were responsible, or both factors. For runs, which constitute the majority of the habitat in the Grand Valley, peak flows that were capable of initiating limited bed movement but not full mobilization did not prevent sedimentation of cobble interstitial voids. Another year of low flows will allow us to determine if DTE will level off at some point or whether rock spaces will continue to fill. The point at which invertebrates will be negatively affected is difficult to determine without having a concurrent invertebrate sampling program at the embeddedness sites. To date, no funds have been available for this additional work.

- VII. Recommendations: Proceed with monitoring as before. Additional funding for concurrent invertebrate monitoring would allow better interpretation of biological implications of embeddedness.
- VIII. Project Status: Project is ongoing and on-track. Field work is scheduled to continue through 2009 and report writing and completion in 2009.
- IX. FY 99 Budget
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| A. Funds Provided: | 10,000 |
| B. Funds Expended: | <u>10,000</u> |
| C. Difference: | 0 |
- X. Status of Data Submission: Not applicable. The database manager only requires submission of fish data.
- XI. Signed: Douglas Osmundson, Fishery Biologist
12/03/99